

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Original) A method for managing Internet Protocol (IP) addresses on a data communications network, comprising:
 - allocating a plurality of local IP address pools, each of said local IP address pools associated with a different network edge device capable of accepting connection requests requiring an IP address, said network edge device having a local memory, said local memory including a local IP address pool database;
 - requesting IP address usage data from one or more of said network edge devices;
 - receiving said requested IP address usage data;
 - determining whether one or more of said plurality of local IP address pools should be reallocated based upon at least said requested IP address usage data;
 - reallocating one or more of said plurality of local IP address pools based upon said determining; and
 - updating one or more of said local IP address pool databases and a global IP pool database based upon said reallocating, said global IP address pool database including the information maintained in each said local IP address pool.

2. (Original) The method of claim 1 wherein
said local IP address pool includes a high watermark that indicates the maximum number of IP addresses used by said network edge device;
said determining further comprises ascertaining whether said high watermark of a local address pool exceeds a high watermark limit; and
said method further comprises indicating one or more IP address pools should be reallocated to give more IP addresses to the network element associated with said high watermark when said high watermark exceeds said high watermark limit.

3. (Original) The method of claim 2 wherein
each said local IP address pool further comprises a low watermark that indicates the minimum number of IP addresses used by said network edge device;
said determining further comprises ascertaining whether said low watermark of said address pool exceeds a low watermark limit; and
said method further comprises indicating one or more IP address pools should be reallocated to reclaim IP addresses from the network element associated with said low watermark when said low watermark exceeds said low watermark limit.

4. (Original) The method of claim 3 wherein said reallocating further comprises: allocating an IP address from IP addresses reclaimed from other IP address pools

when said high watermark exceeds said high watermark limit and when the number of unallocated IP addresses is insufficient; allocating an IP addresses from unallocated IP addresses when said high watermark exceeds said high watermark limit and when the number of unallocated IP addresses is sufficient; and reallocating one or more IP address pools to reclaim IP addresses from a local IP address pool when said high watermark is less than said high watermark limit and said low watermark is greater than said low watermark limit.

5. (Original) The method of claim 1 wherein each said local IP address pool further comprises a low watermark that indicates the minimum number of IP addresses used by said network edge device; said determining further comprises ascertaining whether said low watermark of said address pool exceeds a low watermark limit; and said method further comprises indicating one or more IP address pools should be reallocated to reclaim IP addresses from the network element associated with said low watermark when said low watermark exceeds said low watermark limit.
6. (Original) The method of claim 3 wherein said low watermark is expressed as a percentage of allocated IP addresses; and said high watermark is expressed as a percentage of allocated IP addresses.

7. (Original) The method of claim 6 wherein said network operates according to a simple network management protocol (SNMP).

8. (Original) The method of claim 7 wherein
said low watermark is stored in an expression MIB; and
said high watermark is stored in an expression MIB.

9-24. (Canceled)

25. (Original) A program storage device readable by a machine, embodying a program of instructions executable by the machine to perform a method to manage Internet Protocol (IP) addresses on a data communications network, the method comprising:
allocating a plurality of local IP address pools, each of said local IP address pools associated with a different network edge device capable of accepting connection requests requiring an IP address, said network edge device having a local memory, said local memory including a local IP address pool database;
requesting IP address usage data from one or more of said network edge devices;
receiving said requested IP address usage data;
determining whether one or more of said plurality of local IP address pools should be reallocated based upon at least said requested IP address usage data;

reallocating one or more of said plurality of local IP address pools based upon
said determining; and
updating one or more of said local IP address pool databases and a global IP pool
database based upon said reallocating, said global IP address pool
database including the information maintained in each said local IP
address pool.

26. (Original) The program storage device of claim 25 wherein
said local IP address pool includes a high watermark that indicates the maximum
number of IP addresses used by said network edge device;
said determining further comprises ascertaining whether said high watermark of a
local address pool exceeds a high watermark limit; and
said method further comprises indicating one or more IP address pools should be
reallocated to give more IP addresses to the network element associated
with said high watermark when said high watermark exceeds said high
watermark limit.

27. (Original) The program storage device of claim 26 wherein
each said local IP address pool further comprises a low watermark that indicates
the minimum number of IP addresses used by said network edge device;
said determining further comprises ascertaining whether said low watermark of
said address pool exceeds a low watermark limit; and

said method further comprises indicating one or more IP address pools should be reallocated to reclaim IP addresses from the network element associated with said low watermark when said low watermark exceeds said low watermark limit.

28. (Original) The program storage device of claim 27 wherein said reallocating further comprises:

allocating an IP address from IP addresses reclaimed from other IP address pools when said high watermark exceeds said high watermark limit and when the number of unallocated IP addresses is insufficient;

allocating an IP addresses from unallocated IP addresses when said high watermark exceeds said high watermark limit and when the number of unallocated IP addresses is sufficient; and

reallocating one or more IP address pools to reclaim IP addresses from a local IP address pool when said high watermark is less than said high watermark limit and said low watermark is greater than said low watermark limit.

29. (Original) The program storage device of claim 25 wherein each said local IP address pool further comprises a low watermark that indicates the minimum number of IP addresses used by said network edge device; said determining further comprises ascertaining whether said low watermark of said address pool exceeds a low watermark limit; and

said method further comprises indicating one or more IP address pools should be reallocated to reclaim IP addresses from the network element associated with said low watermark when said low watermark exceeds said low watermark limit.

30. (Original) The program storage device of claim 27 wherein said low watermark is expressed as a percentage of allocated IP addresses; and said high watermark is expressed as a percentage of allocated IP addresses.

31. (Original) The program storage device of claim 30 wherein said network operates according to a simple network management protocol (SNMP).

32. (Original) The program storage device of claim 31 wherein said low watermark is stored in an expression MIB; and said high watermark is stored in an expression MIB.

33-48. (Canceled)

49. (Original) An apparatus for managing Internet Protocol (IP) addresses on a data communications network, the apparatus comprising:
means for allocating a plurality of local IP address pools, each of said local IP address pools associated with a different network edge device capable of accepting connection requests requiring an IP address, said network edge

device having a local memory, said local memory including a local IP address pool database;

means for requesting IP address usage data from one or more of said network edge devices;

means for receiving said requested IP address usage data;

means for determining whether one or more of said plurality of local IP address pools should be reallocated based upon at least said requested IP address usage data;

means for reallocating one or more of said plurality of local IP address pools based upon said determining; and

means for updating one or more of said local IP address pool databases and a global IP pool database based upon said reallocating, said global IP address pool database including the information maintained in each said local IP address pool.

50. (Original) The apparatus of claim 49 wherein
said local IP address pool includes a high watermark that indicates the maximum number of IP addresses used by said network edge device;
said means for determining further comprises means for ascertaining whether said high watermark of a local address pool exceeds a high watermark limit;
and
said apparatus further comprises means for indicating one or more IP address pools should be reallocated to give more IP addresses to the network

element associated with said high watermark when said high watermark exceeds said high watermark limit.

51. (Original) The apparatus of claim 50 wherein each said local IP address pool further comprises a low watermark that indicates the minimum number of IP addresses used by said network edge device; said means for determining further comprises means for ascertaining whether said low watermark of said address pool exceeds a low watermark limit; and said apparatus further comprises means for indicating one or more IP address pools should be reallocated to reclaim IP addresses from the network element associated with said low watermark when said low watermark exceeds said low watermark limit.

52. (Original) The apparatus of claim 51 wherein said reallocating further comprises: means for allocating an IP address from IP addresses reclaimed from other IP address pools when said high watermark exceeds said high watermark limit and when the number of unallocated IP addresses is insufficient; means for allocating an IP addresses from unallocated IP addresses when said high watermark exceeds said high watermark limit and when the number of unallocated IP addresses is sufficient; and means for reallocating one or more IP address pools to reclaim IP addresses from a local IP address pool when said high watermark is less than said high

watermark limit and said low watermark is greater than said low watermark limit.

53. (Original) The apparatus of claim 49 wherein each said local IP address pool further comprises a low watermark that indicates the minimum number of IP addresses used by said network edge device; said means for determining further comprises ascertaining whether said low watermark of said address pool exceeds a low watermark limit; and said apparatus further comprises means for indicating one or more IP address pools should be reallocated to reclaim IP addresses from the network element associated with said low watermark when said low watermark exceeds said low watermark limit.
54. (Original) The apparatus of claim 51 wherein said low watermark is expressed as a percentage of allocated IP addresses; and said high watermark is expressed as a percentage of allocated IP addresses.
55. (Original) The apparatus of claim 54 wherein said network operates according to a simple network management protocol (SNMP).
56. (Original) The apparatus of claim 55 wherein said low watermark is stored in an expression MIB; and said high watermark is stored in an expression MIB.

57-72. (Canceled)

73. (Original) An apparatus capable of managing Internet Protocol (IP) addresses on a data communications network, said apparatus comprising:

 a memory for storing a global IP address pool; and

 a global IP pool manager, comprising:

 an allocator capable of allocating a plurality of local IP address pools, each of said local IP address pools associated with a different network edge device capable of accepting connection requests requiring an IP address;

 a requestor capable of requesting IP address usage data from one or more of said network edge devices;

 a determiner capable of determining whether one or more of said plurality of local IP address pools should be reallocated based upon at least said requested IP address usage data;

 a reallocator capable of reallocating one or more of said plurality of local IP address pools based upon said an indication from said determiner; and

 an updater capable of updating one or more of said local IP address pool databases and said global IP pool database based upon said reallocating.

74. (Original) The apparatus of claim 73 wherein

 said local IP address pool includes a high watermark that indicates the maximum number of IP addresses used by said network edge device; and

said determiner is further configured to ascertain whether said high watermark of a local address pool exceeds a high watermark limit and to indicate IP address pool should be reallocated to give more IP addresses to the network element associated with said high watermark when said high watermark exceeds said high watermark limit.

75. (Original) The apparatus of claim 74 wherein each said local IP address pool further comprises a low watermark that indicates the minimum number of IP addresses used by said network edge device; and said determiner is further configured to ascertain whether said low watermark of said address pool exceeds a low watermark limit and to indicate one or more IP address pools should be reallocated to reclaim IP addresses from the network element associated with said low watermark when said low watermark exceeds said low watermark limit.

76. (Original) The apparatus of claim 75 wherein said reallocator further configured to: allocate an IP address from IP addresses reclaimed from other IP address pools when said high watermark exceeds said high watermark limit and when the number of unallocated IP addresses is insufficient;

allocate an IP addresses from unallocated IP addresses when said high watermark exceeds said high watermark limit and when the number of unallocated IP addresses is sufficient; and
reallocates one or more IP address pools to reclaim IP addresses from a local IP address pool when said high watermark is less than said high watermark limit and said low watermark is greater than said low watermark limit.

77. (Original) The apparatus of claim 73 wherein each said local IP address pool further comprises a low watermark that indicates the minimum number of IP addresses used by said network edge device; and said determiner is further configured to ascertain whether said low watermark of said address pool exceeds a low watermark limit and to indicate one or more IP address pools should be reallocated to reclaim IP addresses from the network element associated with said low watermark when said low watermark exceeds said low watermark limit.

78. (Original) The apparatus of claim 75 wherein said low watermark is expressed as a percentage of allocated IP addresses; and said high watermark is expressed as a percentage of allocated IP addresses.

79. (Original) The apparatus of claim 78 wherein said network operates according to a simple network management protocol (SNMP).

80. (Original) The apparatus of claim 79 wherein
said low watermark is stored in an expression MIB; and
said high watermark is stored in an expression MIB.

81-96. (Canceled)

97. (Newly Added) A method for managing Internet Protocol (IP) addresses on
a data communications network, comprising:

allocating a plurality of local IP address pools, each of said local IP address pools
associated with a different network edge device capable of accepting
connection requests requiring an IP address, said network edge device
having a local memory, said local memory including a local IP address
pool database;

requesting IP address usage data from one or more of said network edge devices;
receiving said requested IP address usage data;

determining whether one or more of said plurality of local IP address pools should
be reallocated based upon at least said requested IP address usage data;

reallocating one or more of said plurality of local IP address pools based upon
said determining;

updating one or more of said local IP address pool databases and a global IP pool
database based upon said reallocating, said global IP address pool
database including the information maintained in each said local IP
address pool;

wherein said local IP address pool includes a high watermark that indicates the maximum number of IP addresses used by said network edge device; wherein said determining further comprises ascertaining whether said high watermark of a local address pool exceeds a high watermark limit; indicating one or more IP address pools should be reallocated to give more IP addresses to the network element associated with said high watermark when said high watermark exceeds said high watermark limit; wherein each said local IP address pool further comprises a low watermark that indicates the minimum number of IP addresses used by said network edge device; wherein said determining further comprises ascertaining whether said low watermark of said address pool exceeds a low watermark limit; and indicating one or more IP address pools should be reallocated to reclaim IP addresses from the network element associated with said low watermark when said low watermark exceeds said low watermark limit.

98. (Newly Added) The method of claim 97 wherein said reallocating further

comprises:

allocating an IP address from IP addresses reclaimed from other IP address pools when said high watermark exceeds said high watermark limit and when the number of unallocated IP addresses is insufficient;

allocating an IP addresses from unallocated IP addresses when said high watermark exceeds said high watermark limit and when the number of unallocated IP addresses is sufficient; and reallocating one or more IP address pools to reclaim IP addresses from a local IP address pool when said high watermark is less than said high watermark limit and said low watermark is greater than said low watermark limit.

99. (Newly Added) The method of claim 97 wherein each said local IP address pool further comprises a low watermark that indicates the minimum number of IP addresses used by said network edge device; said determining further comprises ascertaining whether said low watermark of said address pool exceeds a low watermark limit; and said method further comprises indicating one or more IP address pools should be reallocated to reclaim IP addresses from the network element associated with said low watermark when said low watermark exceeds said low watermark limit.
100. (Newly Added) The method of claim 97 wherein said low watermark is expressed as a percentage of allocated IP addresses; and said high watermark is expressed as a percentage of allocated IP addresses.
101. (Newly Added) The method of claim 97 wherein said network operates according to a simple network management protocol (SNMP).

102. (Newly Added) The method of claim 101 wherein
said low watermark is stored in an expression MIB; and
said high watermark is stored in an expression MIB.

103. (Newly Added) A program storage device readable by a machine,
embodying a program of instructions executable by the machine to perform a method to
manage Internet Protocol (IP) addresses on a data communications network, the method
comprising:
allocating a plurality of local IP address pools, each of said local IP address pools
associated with a different network edge device capable of accepting
connection requests requiring an IP address, said network edge device
having a local memory, said local memory including a local IP address
pool database;
requesting IP address usage data from one or more of said network edge devices;
receiving said requested IP address usage data;
determining whether one or more of said plurality of local IP address pools should
be reallocated based upon at least said requested IP address usage data;
reallocating one or more of said plurality of local IP address pools based upon
said determining;
updating one or more of said local IP address pool databases and a global IP pool
database based upon said reallocating, said global IP address pool
database including the information maintained in each said local IP
address pool;

wherein said local IP address pool includes a high watermark that indicates the maximum number of IP addresses used by said network edge device; wherein said determining further comprises ascertaining whether said high watermark of a local address pool exceeds a high watermark limit; indicating one or more IP address pools should be reallocated to give more IP addresses to the network element associated with said high watermark when said high watermark exceeds said high watermark limit; wherein each said local IP address pool further comprises a low watermark that indicates the minimum number of IP addresses used by said network edge device; wherein said determining further comprises ascertaining whether said low watermark of said address pool exceeds a low watermark limit; and indicating one or more IP address pools should be reallocated to reclaim IP addresses from the network element associated with said low watermark when said low watermark exceeds said low watermark limit.

104. (Newly Added) The program storage device of claim 103 wherein said reallocating further comprises:
allocating an IP address from IP addresses reclaimed from other IP address pools when said high watermark exceeds said high watermark limit and when the number of unallocated IP addresses is insufficient;

allocating an IP addresses from unallocated IP addresses when said high watermark exceeds said high watermark limit and when the number of unallocated IP addresses is sufficient; and reallocating one or more IP address pools to reclaim IP addresses from a local IP address pool when said high watermark is less than said high watermark limit and said low watermark is greater than said low watermark limit.

105. (Newly Added) The program storage device of claim 103 wherein each said local IP address pool further comprises a low watermark that indicates the minimum number of IP addresses used by said network edge device; said determining further comprises ascertaining whether said low watermark of said address pool exceeds a low watermark limit; and said method further comprises indicating one or more IP address pools should be reallocated to reclaim IP addresses from the network element associated with said low watermark when said low watermark exceeds said low watermark limit.

106. (Newly Added) The program storage device of claim 103 wherein said low watermark is expressed as a percentage of allocated IP addresses; and said high watermark is expressed as a percentage of allocated IP addresses.

107. (Newly Added) The program storage device of claim 103 wherein said network operates according to a simple network management protocol (SNMP).

108. (Newly Added) The program storage device of claim 107 wherein
said low watermark is stored in an expression MIB; and
said high watermark is stored in an expression MIB.

109. (Newly Added) An apparatus for managing Internet Protocol (IP) addresses
on a data communications network, comprising:

means for allocating a plurality of local IP address pools, each of said local IP
address pools associated with a different network edge device capable of
accepting connection requests requiring an IP address, said network edge
device having a local memory, said local memory including a local IP
address pool database;

means for requesting IP address usage data from one or more of said network
edge devices;

means for receiving said requested IP address usage data;

means for determining whether one or more of said plurality of local IP address
pools should be reallocated based upon at least said requested IP address
usage data;

means for reallocating one or more of said plurality of local IP address pools
based upon said determining;

means for updating one or more of said local IP address pool databases and a
global IP pool database based upon said reallocating, said global IP
address pool database including the information maintained in each said
local IP address pool;

wherein said local IP address pool includes a high watermark that indicates the maximum number of IP addresses used by said network edge device; wherein said means for determining further comprises means for ascertaining whether said high watermark of a local address pool exceeds a high watermark limit; means for indicating one or more IP address pools should be reallocated to give more IP addresses to the network element associated with said high watermark when said high watermark exceeds said high watermark limit; wherein each said local IP address pool further comprises a low watermark that indicates the minimum number of IP addresses used by said network edge device; wherein said means for determining further comprises means for ascertaining whether said low watermark of said address pool exceeds a low watermark limit; and means for indicating one or more IP address pools should be reallocated to reclaim IP addresses from the network element associated with said low watermark when said low watermark exceeds said low watermark limit.

110. (Newly Added) The apparatus of claim 109 wherein said means for reallocating further comprises:

means for allocating an IP address from IP addresses reclaimed from other IP address pools when said high watermark exceeds said high watermark limit and when the number of unallocated IP addresses is insufficient;

means for allocating an IP addresses from unallocated IP addresses when said high watermark exceeds said high watermark limit and when the number of unallocated IP addresses is sufficient; and

means for reallocating one or more IP address pools to reclaim IP addresses from a local IP address pool when said high watermark is less than said high watermark limit and said low watermark is greater than said low watermark limit.

111. (Newly Added) The apparatus of claim 109 wherein each said local IP address pool further comprises a low watermark that indicates the minimum number of IP addresses used by said network edge device; said means for determining further comprises means for ascertaining whether said low watermark of said address pool exceeds a low watermark limit; and said apparatus further comprises means for indicating one or more IP address pools should be reallocated to reclaim IP addresses from the network element associated with said low watermark when said low watermark exceeds said low watermark limit.

112. (Newly Added) The apparatus of claim 109 wherein said low watermark is expressed as a percentage of allocated IP addresses; and said high watermark is expressed as a percentage of allocated IP addresses.

113. (Newly Added) The apparatus of claim 109 wherein said network operates according to a simple network management protocol (SNMP).

114. (Newly Added) The apparatus of claim 113 wherein
said low watermark is stored in an expression MIB; and
said high watermark is stored in an expression MIB.

115. (Newly Added) An apparatus capable of managing Internet Protocol (IP) addresses on a data communications network, said apparatus comprising:
a memory for storing a global IP address pool; and
a global IP pool manager, comprising:
an allocator capable of allocating a plurality of local IP address pools, each of said local IP address pools associated with a different network edge device capable of accepting connection requests requiring an IP address;
a requestor capable of requesting IP address usage data from one or more of said network edge devices;
a determiner capable of determining whether one or more of said plurality of local IP address pools should be reallocated based upon at least said requested IP address usage data;
a reallocator capable of reallocating one or more of said plurality of local IP address pools based upon said an indication from said determiner;
an updater capable of updating one or more of said local IP address pool databases and said global IP pool database based upon said reallocating;

wherein said local IP address pool includes a high watermark that indicates the maximum number of IP addresses used by said network edge device; wherein said determiner is further configured to ascertain whether said high watermark of a local address pool exceeds a high watermark limit and to indicate IP address pool should be reallocated to give more IP addresses to the network element associated with said high watermark when said high watermark exceeds said high watermark limit;

wherein each said local IP address pool further comprises a low watermark that indicates the minimum number of IP addresses used by said network edge device;

wherein said determiner is further configured to ascertain whether said low watermark of said address pool exceeds a low watermark limit and to indicate one or more IP address pools should be reallocated to reclaim IP addresses from the network element associated with said low watermark when said low watermark exceeds said low watermark limit.

116. (Newly Added) The apparatus of claim 115 wherein said reallocator is

further configured to:

allocate an IP address from IP addresses reclaimed from other IP address pools when said high watermark exceeds said high watermark limit and when the number of unallocated IP addresses is insufficient;

allocate an IP addresses from unallocated IP addresses when said high watermark exceeds said high watermark limit and when the number of unallocated IP addresses is sufficient; and
reallocate one or more IP address pools to reclaim IP addresses from a local IP address pool when said high watermark is less than said high watermark limit and said low watermark is greater than said low watermark limit.

117. (Newly Added) The apparatus of claim 115 wherein each said local IP address pool further comprises a low watermark that indicates the minimum number of IP addresses used by said network edge device; and said determiner is further configured to ascertain whether said low watermark of said address pool exceeds a low watermark limit and to indicate one or more IP address pools should be reallocated to reclaim IP addresses from the network element associated with said low watermark when said low watermark exceeds said low watermark limit.

118. (Newly Added) The apparatus of claim 115 wherein said low watermark is expressed as a percentage of allocated IP addresses; and said high watermark is expressed as a percentage of allocated IP addresses.

119. (Newly Added) The apparatus of claim 115 wherein said network operates according to a simple network management protocol (SNMP).

120. (Newly Added) The apparatus of claim 119 wherein
said low watermark is stored in an expression MIB; and
said high watermark is stored in an expression MIB.